Amendments to the Drawings:

The attached sheet of drawings includes new Fig. 1. The new figure is a block diagram of the steps as described in the specification and claims as filed.

Attachments: Replacement Sheet

REMARKS

Prior to this amendment, claims 1-12 were pending in this application. Claims 1-12 were rejected in the Office Action dated 09 February 2007. Claims were amended to emphasize certain aspects of the invention and to remove multiple dependency. No new matter was added.

Claim objections

Claim 6 has been corrected.

Rejections under 35 U.S.C. § 112

Claims 1 to 10 have been amended such that it distinctly claims the subject matter "apparatus".

Claim 3 has been amended to include the proper limitation to "the seismic or microseismic event" as per the antecedent in claim 1.

Claim 8-10 have been amended to clearly point out and distinctly clam the inventive subject matter.

Rejections under 35 U.S.C. § 101

Examiner rejected all pending claims 1-3 and 6-12 under 35 U.S.C. § 101 "because the claimed invention is directed to non-statutory subjection matter." Applicants respectfully traverse.

It is noted that the referenced PTO interim guidelines published in the OG notice "do not constitute substantive rulemaking and hence do not have the force and effect of law. Rejection will be based on substantive law, . . ." (*See* the second paragraph after Introduction.) Since it is not law and cannot be used in any rejections, the Guideline is irrelevant here. The law is 35 U.S.C. § 101 and the interpretations by the courts. Whether it is clear or not "how the result is being stored, displayed or used in any tangible manner" is irrelevant.

The legal requirement for an invention to be patentable is stated in 35 U.S.C. § 101, i.e. "new and useful." The present invention is "useful" because it helps to locate a seismic or microseismic event underneath the earth surface. The tangible product of the present invention is an "arrival time" of such an event in cases where such arrival times are difficult to pick directly from the data. The product of the invention is a "useful, concrete and tangible result," that is similar to the "condition of a patent's heart" in Arrhythmia, or the "smooth waveform" in Alappat. *See State Street*, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02, *In re Alappat*, 33 F.3d 1526, 31 USPQ2d 1545 (Fed. Cir. 1994) (in banc), *Arrhythmia Research Tech. v. Corazonix Corp.*, 958 F.2d 1053, 22 USPQ2d 1033 (Fed. Cir. 1992).

Claim 11 has been cancelled.

Rejections under 35 U.S.C. § 102

Currently, claims 1-4, 6-10, and 12 stand rejected under 35 U.S.C. 102(e) as being anticipated by Garotta (6639871), claims 1-12 by Zhang (US20030021184), claims 1-3, 8-10, and 12 stand rejected under 35 U.S.C. 102(b) as being anticipated by Audebert (WO0131364) and claims 1-3, and 12 stand rejected under 35 U.S.C. 102(b) as being anticipated by Sayers (6067275).

Because of the common distinguishing features between the cited references and the present invention, the following arguments apply to all four references ("the references").

(a) The references are not pertinent to the present invention:

All of the references disclose a standard seismic survey. A standard seismic survey includes precise knowledge of the source of a seismic wave, its location and shot time, i.e., the time of origin. In contrast, for the present invention these parameters are unknowns.

The references disclose various methods of determining the compressional wave velocity Vp and the shear wave velocity Vs from a standard seismic survey. In contrast, the present invention assumes that at least the ratio R of Vp/Vs is known.

Some of the references address the problem of identifying or distinguishing between P- and S-wave events. However, the methods disclosed are meant to distinguish between events which can be attributed to P-waves and events which can be attributed to S-wave. Though more fundamental, it should be noted that the present invention again treats this problem as solved. The present invention is concerned with picking or estimating arrival time in the respective P- or S- wave data. Again, this problem is not mentioned in the cited references.

(b) The references do not include important elements of the invention as currently claimed:

None of the reference teaches or suggests to "calculate an estimate time of arrival". In the context of the references, the concept of an "arrival time" is irrelevant. The references make use of "travel times" which refers to the time a wave takes from it origin to the receiver (or any other two reference points). In contrast, the arrival time is the time at which a wave arrives at the receiver. It would be of course trivial to determine the traveltime from the arrival time if the time of origin was known. But the present invention does not assume knowledge of the time of origin. Hence, the parameters "Tp" and "Ts" as mentioned in the various references are travel times, whereas in the present invention "Tp" and "Ts" stand for arrival times.

None of the references teaches or suggests to "calculate an estimated time of origin". In the context of the references, the time of origin of a seismic event is parameter which is already known with great accuracy.

Moreover, none of the cited references teaches or suggests "calculating the estimated time of arrival of the P or S wave, based on a P to S wave velocity ratio, the estimated time of origin of the event and, where the estimated arrival time of a P wave is to be

calculated, a picked arrival time of the S wave at the sensor station for which the estimated arrival time of the P wave is being calculated or, where the estimated arrival time of a S wave is to be calculated, a picked arrival time of the P wave at the sensor station for which the estimated arrival time of the S wave is to be calculated."

Where in the cited references the step of "identifying P- or S-wave events" is mentioned, it is a step of distinguishing in the recorded signal whether an event is an S-wave or a P-wave. In many cases, this problem is compounded by the difficulty that the event is actually a mode converted event, i.e., an event which started as a P-wave and is at some earth layer converted into an S-wave, which then may be re-converted into a P-wave before being registered (giving thus rise to a so-called PSP-event). PP- and PS-wave events are for example graphically illustrated in FIGs. 2 and 3 of Zhang.

However complex the difficulties in identifying P- or S-wave events may be, it is important to note that this step has no bearing on the step of estimating the arrival time of an event (be it a P-wave event or an S-wave event). In the former, the nature of the event is investigated, in the latter its position on the time axis.

More specifically, the use of a time of origin derived from data registered at one receiver to determine the time of arrival of an event at a second receiver is neither disclosed nor suggested in any of the cited references.

In summary, the cited references whether alone or in combination are relevant only as background on how to establish knowledge of the earth properties, namely density, Vp and Vs of successive layers of earth. The present invention however assumes this knowledge as given and, together with novel and inventive elements, provides an apparatus and methods to solve a problem not even contemplated in those references.

Hence, it is respectfully requested that the section 102 rejections of independent claims 1 and 12 as amended, be withdrawn. Additionally, it is respectfully requested that the section 102 rejection of all claims depending from independent claims 1 and 12 also be withdrawn.

In light of the above amendments and remarks, applicant believes that the present application is in proper condition for allowance. Such allowance is earnestly requested. If the Examiner is contemplating any action other than allowance of all pending claims or requires further clarification on the issues raised by this response, the Examiner is urged to contact applicant's representative, Jody Lynn DeStefanis, at (617) 768-2269.

Respectfully submitted,

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